Artículo de investigación

Project technologies in a university's media educational strategy in developing a probabilistic style of thinking for future mathematics teachers

Проектные технологии в процессе реализации медиаобразовательной стратегии университета как фактор развития вероятностного стиля мышления будущих педагогов-математиков

Tecnologías de proyecto en una estrategia educativa de medios universitarios para el desarrollo de un estilo probabilístico de pensamiento para futuros profesores de matemáticas

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Abstract

The relevance of this study is determined by the scientific and socio-practical significance of the training of future mathematics teachers. Nowadays, they should not only be professionals in their sphere but also have a high level of media education. Media projects, carried out by students within the framework of media training and integrated into the disciplines of the methodological module, have contributed to the development of knowledge and skills related to the media space. As a result, a probabilistic style of thinking (PST) has appeared that corresponds to the challenges of the time and the scientific paradigm. The research problem consists of developing theoretical and methodological principles and integrative technological mechanisms for the PST of future mathematics teachers. The results of the study experimentally confirm the significance of media projects implementation in educational disciplines for the

Аннотация

Актуальность исследования определяется научной и социально-практической значимостью процесса подготовки будущих учителей математики, которые должны быть не только профессионалами в своей сфере, но и иметь высокий уровень медиа-образования, являющийся необходимым условием общей культуры современного человека. На основе медиа-проектов, выполненных студентами в рамках интегрированной в дисциплины методического модуля медиа-подготовки, формируются знания и умения, связанные с медиа-пространством, развивается соответствующий вызовам времени и научной парадигмам тип мышления – вероятностный. Проблема исследования заключается в поиске, осуществляемом в русле медиа-образования, теоретических и методических положений, интегративных технологических механизмов развития ВСМ будущих учителей математики. Результаты

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training of future mathematics teachers. This study contributes to the development of a PST.
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Keywords: Mathematical education, media projects, innovative technologies.

исследования экспериментально подтверждают значимость медиа-проектов, внедренных в образовательные дисциплины подготовки будущих учителей математики, для развития у них вероятностного стиля мышления.
Исследование выполнено при финансовой поддержке Российского фонда фундаментальных исследований. Проект 18-313-20002 «Теоретико-методическое обеспечение фрактального формирования и развития вероятностного стиля мышления в условиях глобальной информатизации образования (на примере обучения математике)».

Ключевые слова: математическое образование, медиа-проекты, инновационные технологии.

Resumen

La relevancia de este estudio está determinada por la importancia científica y socio-práctica de la formación de futuros profesores de matemáticas. Hoy en día, no solo deben ser profesionales en su esfera, sino también tener un alto nivel de educación en medios. Los proyectos de medios, llevados a cabo por estudiantes en el marco de la capacitación en medios e integrados en las disciplinas del módulo metodológico, han contribuido al desarrollo de conocimientos y habilidades relacionadas con el espacio de medios. Como resultado, ha aparecido un estilo de pensamiento probabilístico (PST) que corresponde a los desafíos de la época y el paradigma científico. El problema de investigación consiste en desarrollar principios teóricos y metodológicos y mecanismos tecnológicos integradores para el PST de los futuros profesores de matemáticas. Los resultados del estudio confirman experimentalmente la importancia de la implementación de proyectos de medios en disciplinas educativas para la formación de futuros profesores de matemáticas. Este estudio contribuye al desarrollo de un PST.
Este estudio fue financiado por RFBR de acuerdo con el proyecto de investigación № 18-313-20002, titulado “Aseguramiento teórico y metódico de la formación fractal y el desarrollo de un estilo de pensamiento probabilístico en la informatización global de la educación (en el ejemplo de la enseñanza de las matemáticas) ".

Palabras clave: Educación matemática, proyectos de medios, tecnologías innovadoras.

Introduction

Modern culture, based on the informative civilization reflects a steady naming of “media.” Humankind has also changed. Minaev figuratively called modern humans “Media Sapiens.” Characterizing our contemporary society, Vartanova (2010) rightly notes that living is largely determined by the content of mass communication.

Over the past decades of the new century, the status of the media person has changed. Nowadays, we do not just consume information, but we also actively distribute and even produce media products. Moreover, it can already be stated at the empirical level that media creativity of communication process participants is constantly developing. It involves more and more people who want to express themselves and their views. They have the most basic inclinations and the necessary technical skills at the user level. Social media as a new form of communication has become not only a way of expressing social conscience, but also a serious alternative to traditional media with its wide audience, and therefore the possibility to influence its consciousness. The influence of media on social progress is determined by the current state of the information and communication space as a whole

as well as the convergent processes caused by the introduction of the latest technical achievements. The key factors of the sustainable and effective functioning and development of socioeconomic systems are: the speed of receiving and transmitting information, volume and quality, preservation, and well-timed application. The introduction of new communication channels, such as mobile communication, the Internet, and network media provides the society as a whole and individual citizen with access to global television, radio broadcasting, and a worldwide network of newspapers, magazines, and news agencies.

In this regard, media education is a necessity as a new strategic approach for social promotion. It represents the "process of formation and development of the individuality basing on the use of mass communication. As a result, the culture of communication with the media is developing" (Zhilavskaya, 2009), as well as adequate perception, critical assessment, and independent creativity. Other components of a person's media culture regarded as important are the skills aimed at self-expression with the help of media technology.

According to the world experience, it is necessary to start media education in preschool training groups and then develop it in schools and higher educational institutions. In fact, media education should match scientific, technical, and cultural progress. Personal and professional needs, as well as the amount of information that a person of the 21st century receives, determine rational and individual improvement. Otherwise, the communication environment does more harm than good, oppressing a person psychologically and reducing his social adaptation. However, it is obvious that "it is impossible to simply get out of mass communication. You cannot completely disconnect from it. This contributes to either a regression of the individual (in the case of an individual) or a breakdown of society (in mass cases)" (Zhilavskaya, 2009).

The educational process at the university, aimed at training specialists in various fields of social life, should be relevant to the challenges of the information and communication space in which it takes place. A UNESCO resolution (Sevilla, 2002) noted the need for media education to be compatible with the regional cultural atmosphere and media products. In this context, recommendations were developed for higher education institutions that must improve their educational strategy. Thus, the universities should take into account at least two components, namely: media training of specialists in the field of mass media and media literacy of other specialists. They should be focused on continuous professional development and meeting the rapidly changing demands of the media public. In addition, they should be able to respond to the challenges of the information space and its technical equipment. The main function of the "new" specialist is to develop a media product that actually reflects the current problems of humankind. In addition, they should be ready to fulfill an equally significant and socially responsible mission, namely, to conduct mass media educational activities among the population, and therefore should know its methodology.

It is also difficult to overestimate the university training of modern specialists in other areas of material and spiritual production, capable of constant self-development and analytical and prognostic understanding of the challenges of time and situation, and nonstandard decision making. Any sphere of employment requires media knowledge. The statement of the famous Canadian sociologist McLuhan about the necessity to be literate in the field of media (1964) was repeatedly proved. Therefore, the introduction of media educational projects as a new pedagogical technology should become an integral part of the educational training of the future specialists.

The educational, training, and creative aspects of media education technologies are especially significant for the teachers of mathematics. In the context of cultures dialogue and mathematical education improvement and development are particularly significant. The authors consider it a factor providing the development of effective educational environment for the improvement of educational material, enriched with new high-quality components, characteristics, and forms. In addition, it becomes the basic methodology for identifying the content of media educational technologies. "We consider the dialogue of natural science and humanitarian cultures in the educational space as interaction, interinfluence, and cross-fertilization between different aspects of knowledge. This provides the idea of different ways of the reality understanding, namely, rational scientific and irrational humanitarian; fundamentally different, incommensurable types of thinking, ways of information perception. It forms a holistic understanding of nature, society, and human being. It is also a factor that impacts the development of post-non-classical values and interdisciplinary systemic knowledge" (Dvoryatkina, 2013).

The authors declare that in the context of information flow intensification, the students' (future mathematics teachers) training in media educational technologies within the framework of university training can become an effective means of developing the following personal characteristics:

- Independent, critical and creative thinking,
- The commitment to the communication space, cultural and social spheres, and
- Readiness to complete the professional mission.

At the same time, not only the media knowledge and skills acquired at the university are significant. A special thinking style that corresponds to the modern scientific paradigm and provides an opportunity for continuous professional and personal improvement is necessary. It is proven that the goals of media education are related to the development of critical thinking in media sphere, namely, analytical skills (analysis, synthesis, forecasting) (Fedorov, 2003). "Critical thinking is defined as evaluative, reflective thinking, which assumes the ability to raise new, meaningful questions, to develop diverse, supportive arguments, and make independent, rational decisions. This concept includes a rational assessment of the thought process itself, namely, the course of reasoning that contributed to certain conclusions, or to those factors that were taken into account when making a decision" (Chelysheva, 2009). The critical component of thinking is the most important element of the probabilistic style of thinking (PST). It is correlated to the probabilistic nature of the world processes, and serves as the standard of professional thinking that introduces new competencies requirements for the training of modern teachers of mathematics.

Nowadays, the world scientific community focuses on media education issues. Fundamental theoretical works have been developed; active practical work is being conducted under the UNESCO auspices. In Russia, a domestic module of media education was developed in 2003. It should be reasonably implemented into educational institutions of various levels, especially into universities, as the centers of media and cultural environment formation. The practical and utilitarian approach for media education development, based on the critical study of the media space, seems to us to be paramount and promising, correspondent to the modern probabilistic style of thinking. The combination of these components can form the basis of a successful media educational strategy of the university.

The research problem consists in development of theoretical and methodological principles, and integrative technological mechanisms for the PST of future mathematics teachers.

The main purpose of the research is to study the issues of theoretical justification, development, and practical implementation of media educational projects into the training of the students of the pedagogical sphere (Mathematics). The authors suggest that media educational projects serve as a new pedagogical technology for the development of high-school courses. Thus, the analysis of its effectiveness is conducted.

Literature review

In the 20th century, the issues of the impact of media on people and society have been studied by various foreign researchers, namely Bart, Deleuze, McLuhan, Ortega-y-Gasset, Kristev, Toffler, and others. In Russia, the analysis of media culture features was carried out by the representatives of semiotics and psychology, such as Bakhtin, Bibler, Lotman, Vygotsky, and others. At the turn of the 20th and 21st centuries, the processes of the informatization of society and the impact of the new media culture on humans were the focus of attention of such Russian scientists as Vartanova, Zasursky, Kirillova, Fedorov, Sharikov, and others.

Within the literature in the Russian language, the analysis of media education theories is most fully represented in the works by Fedorov and his scientific school (Fedorov, 2001). The researcher considers the theory of media education as the development of critical thinking. Proponents of this theory first study "codes," with the help of which media influences the audience, distributing the social values and forming people's behavior. Therefore, the goal of media education is to teach how to analyze critically the ways of media manipulation. This will contribute to free orientation in the information space of a democratic society. In the framework of international survey, 84.61% of experts voted for this approach in media education (Fedorov, 2004).

The concept of "critical thinking" in the context of media education was introduced by the British researcher Masterman. He considers media education as a search for new ways of

communication between teachers and students in the process of their common "co-investigation" of media. As a result, "critical autonomy" develops, that is a person's ability to analyze media texts independently and rationally (Masterman, 1997). Gonnet, head of the French media education center CLEMI, holds a similar view. He believes that the main focus in the sphere of his organization's activity is helping young people master "autonomous thinking," which allows them to become truly free citizens of a democratic society (Gonnet, 1997). American scientist Cluster characterizes critical thinking as "independent," "individual," and "social," which begins with the understanding of the problems. It is connected with the search for convincing arguments for the chosen solution and is aimed at motivating, encouraging a person to find "complex thoughts" based on facts, ideas, theories, concepts, and data (Cluster, 2002). This kind of thinking developed on the basis of media will help protect young people from the lies, understatements, and unprovedness that they can easily find in any media product.

It is not a coincidence that scientists from the USA and many European countries recognized the necessity of critical thinking development for the younger generation in the process of media education. It was even included in the educational goals of the school education.

In Russian science, there are also many works on the problem of critical thinking development in the context of media education (Bondarenko, Fedorov, Sharikov and others).

In the Russian theory of journalism, media criticism (professional and mass), the approach developed by Professor Korochensky, is the closest one to media educational discourse (Korochensky, 2003). In his works, the researcher considers the combination of media education and media criticism as an effective way of modern person's media competence development.

Nowadays, in many countries (Australia, Great Britain, Canada, France, etc.) there is a well-developed system of media education in secondary and higher educational institutions. In some cases, media education is integrated into school disciplines. In Australia and Canada, for example, it starts in preschool institutions. In Russia, media education is not a mandatory component of the school and university programs. The only exception is the training approach "Media Education", implemented in Russian higher education since 2002. At the same time, analyzing the models of media educational activity in Russia, Fedorov, A.V. notes that media education at school and university "can be integrated into traditional disciplines or be autonomous" (Fedorov, 2004). According to Fateeva, all theories existing in the sphere of media education include a practical approach, which can be reasonably considered as the basis of media educational pedagogical activity. At the same time, the mastery of the necessary technique by students is not the goal, but the means of creation of all kinds of original media texts. In this regard, the researcher considers media educational projects as a pedagogical technology. Corporate press and projects specially created for educational purposes are also considered as such (Fateeva, 2007).

The authors believe that such projects should be widely applied in the media educational activities of the universities, regardless of the sphere of students' training. Their successful implementation contributes to the development of critical thinking, which is the element of PST, and forms the media competence of a future specialist.

Methodology

The philosophical concept of cultures dialogue provides a methodological basis for studying the development of a probabilistic style of thinking. The problems of dialogue have been studied within the framework of dialogical philosophy (Bakhtin, Bibler, Buber and others).

Contemporary researchers (linguists, psychologists, culturologists, educators, etc.) interpret cultures dialogue primarily as a means of intercultural communication, namely, as the interaction of different nations, and as a component of international relations. Academician Lihachev defined intercultural dialogue as the preservation and transmission of cultural traditions and values, and the integration of creative activity trends of the past, which are important for modern development (Lihachev, 2006). In 1959, Charles P. Snow delivered a lecture "The Two Cultures" in which he applied the term "culture," not to define an ethnic group, but a layer of intellectuals, and distinguished the humanities groups from the science communities by demonstrating that they have different cultures (Snow, 1985). The bases of different worldviews are formed by the specialized characteristics of particular educational domains, and the resulting incompleteness of knowledge is

necessary in the transitional era to prevent a civilization crisis.

In the present study, this approach contributes to the enrichment of the educational process by providing dialogical techniques and methods for pedagogical interaction. As a result, favorable conditions are created for the effective development of students. In fact, dialogic principles always determine educational activities in youth settings. In the context of methodology, it is supplemented by the principle of antinomy and allows us to understand various aspects of media education. Kirillova declares that "Media is one of the factors of practical implementation of the "cultures dialogue" theory" (Kirillova, 2005).

A quantitative assessment of the PST in the context of media technologies integration into the teaching of mathematics was carried out on the basis of a holistic methodological complex developed earlier by the authors. It included the analysis of the following PST components: logical, intuitive, predictive, reasonably heuristic, critical and combinatorial (Dvoryatkina, Shcherbatykh, 2019).

Yelets State Ivan Bunin University (Russia) served as the experimental base of the research. The students of pedagogy (profile - Mathematics) aged from 18 to 24 participated in the experiment. The experimental sample (n1 = 30) comprised the students. Methodological (for bachelors) and substantive (for masters) modules training was based on the integration of media education technology in the educational process. The control group (n2= 30) with teaching based on traditional methods was represented by the students of the same profile. The formation of the control and experimental groups met the requirements of homogeneity, non-repetition, and representativity. The validity and reliability of psychodiagnostic procedures in the experiment was provided by the selection of the methods themselves.

Results and discussion

Development of the probabilistic style of thinking

The authors introduce a project technology for media education within the framework of mathematical education at school and university. It is based on the cultures dialogue as an effective means of PST development in the context of an intensive increase of the information flow.

Media education technology within the structure of mathematical education based on the cultures dialogue has the following **goals**:

- *Development of the students' PST* by means of cognitive processes activation through the creation of a developing environment within the framework of the selected media educational strategy. This will provide solving practice-oriented tasks solution, as well as the particular problems of social interaction in situations of uncertainty, and comparative remoteness of subject areas of the problem;
- *Comprehensive development of the student's personality in the context of integrated media education,* which presumes the maximum development of virtual and audiovisual imagination, experimentation, media forecasting; perception, critical reflection and analysis of media products; assessment of media functioning in society and in the professional activities of teachers;
- *Development of skills for creation and promotion of the original media products* for educational purposes as a way of personal expression through dialogue, personal choice, and critical study of the media market;
- *Formation of the teachers' individual style* of pedagogical activity, development of intellectual abilities and mathematical competencies of students in the research process, adaptation in various types of communications (including network) and interactions based on the cultures dialogue;
- *Formation of individual learning approaches* based on psychological characteristics, interests, and values of the students and differentiation of educational material according to the profile of the training, the complexity and difficulty of the educational material within the framework of the multifunctionality of cognitive support tools;
- *Formation of the teacher's availability for innovation,* aimed at productive and creative solutions of pedagogical problems, relying on innovations in the projecting and organizing of educational, training and diagnostic activities; innovative techniques development; mastery of the methods and tools of pedagogical innovation; the

ability to adapt and develop in the media space.

The technology of media education in the structure of mathematical education based on the cultures dialogue follows **general didactic and special principles**, namely: dialogics; information richness of educational material; scientificalness, reliability, and accessibility of information; interdisciplinarity of educational content; social conditionality of the subject of reflection; unity of educational and technological logic; communication skills; problematic content of the material; polymotivation; competencies and abilities to determine the value of information.

Technology content

The technology used in media education within the structure of mathematical education is based on the cultures dialogue and is implemented through the projecting of the educational material. Its purpose is to meet the educational and professional needs of the individual, aimed at the maximum improvement of his abilities and characteristics. The main form of technology implementation is media education project. The methodology of its development and implementation into practice are necessary components of the professional training for mathematics teachers. The authors determine *media educational project* as active education aimed at developing the successful unique media product for educational purposes.

The researchers distinguish the following basic types of media educational projects applied in professional education: printed (mathematical newspapers, popular scientific articles on mathematics and the history of mathematics in corporate editions of the university), visual, audio-visual and multimedia (educational slide films, video films, animation, digital presentation), electronic (interactive scripts for mathematics lessons and additional courses, electronic textbooks and workshops in mathematics, online distance training courses, interactive mathematical simulators and games, etc.), Internet projects (websites, pages in social networks, blogs).

The authors distinguish several stages in the process of media project implementation. They are introduced in Table 1.

Table 1. Technological chart of parameters and characteristics for the support of the media educational activities of the teacher and the student

Stages	**Student's Activity**	**Teacher's Activity**
Preparatory and organizational .1	- The multiplicity of goal-setting and experience in solving micro-problems of mathematical education by means of media project activities; - Generating ideas on the subject and problematic of the project; - Hypothesis, verification of the project relevance; - Statement of the problem and search for its solution by means of mathematics; - Propositions on the operational capabilities of the project participants; - Selection of organizational forms, methods and training tools for media project activities; - Small group work and culture dialogue;	- Development of a creative environment for media educational activities within the structure of teaching mathematics; - Development of intellectual tension situations through culture dialogue, actualization of problematic situations; - Development of the innovative methods of mathematical education: problem - reflection - modeling - insight - analysis - solution verification - transfer to students' multifunctional and differentiated media project activities; - Generalization of students' proposals on the problem and thematic approach of the project; - Assessment of the hypothesis and project relevance;

			- Analysis of upcoming work, the appointment of performers of each stage of the project; - Success stimulation; tolerance for uncertainty; readiness for discussions and a multiplicity of problems solutions; - Identification and popularization of patterns of creative behavior and its results;
Informative	.2	- Joint analysis of the problem in the form of creative group discussion; - Formation of the project objectives; - Analysis of the updated information about the content and problematic approach of the project; - Actualization of the multiplicity of decisions based on data uniqueness; - the formation of the ability to adapt and develop in social communications basing on culture dialogue;	- The choice of the approach for the problem analysis, the organization of the discussion; - Adjustment (clarification) of the tasks; - Clarification of the information necessary for the successful implementation of the project; - Development of the situations of choice and uncertainty, decision making with a high degree of responsibility; - Personal experience of creativity and the formation of an individual style of pedagogical activity;
Planning and prognostic	.3	- Brainstorming with propositions on project work; - Development of guidelines and plan for solving the problem, an analysis of the ICT capabilities, means of technical support, formation of the integral decision procedure; - Intuition and prediction of results, search for solution algorithms, insight, fixing and verification of procedures and algorithms;	- Development of the situations of choice and uncertainty, decision making with a high degree of responsibility; - Organization of discussion of the project work plan; - Synthesis of ideas presented; - Argumentation of the optimal option selection for joint work on the project.
Technological and executive	.4	- project implementation: 1. Creating a video: scripting, writing off-screen text, shooting the material, synchronizing, film editing; 2. Writing a popular scientific article: collecting factual material, composing text, editing, selecting photos and other elements of visualization, preparing for publishing; 3. Website development: selecting a website sample, clarifying the rubrication and navigation, filling sections with text and multimedia materials.	- Technical support of the project (selection of the necessary equipment, consultation on its operation); - Consultation of the project participants on the genres of journalism, the features of the popular scientific style, the specifics of the presentation of mathematical material. - Help in choosing a hosting for the site, consultation on sections filling.
Control and evaluative	.5	Analysis of the intermediate results of the project,	- Hypothesis testing, their modification, assessment of

		adjustments, discussion of the results, determination of the successful and unsuccessful moments in the tasks implementation, elimination the shortcomings and preparation of the final version of the project.	methods and procedures for results searching, the ability to set and solve problems in the context of uncertainty; - Assessment of the hypotheses truth, forecast and strategies; introspection of preferences for choosing the optimal solution; - Monitoring and evaluating of the effectiveness of media project in the process of pedagogical problem solution, determination of the student's development; - Discussion of the intermediate and final results of the project, a motivated assessment of successes and failures
Final	.6	- Presentation of the project, summing up the results of joint activities; - Integration of subject, information, mathematical and professional knowledge into the formulation and solution of research and professional tasks using media technology; - Development of • professional motivation, verification of the results by means of dissemination and testing of pedagogical experience.	- Analysis of the creative potential of the project participants, determination of the prospects for the implementation of the project into the educational sphere; - Psychodiagnostics of personal qualities, determination of the speed and intensity of cognitive operations, emotional state regulation; - Further actions assessment and forecast, motivation for self-actualization.

Media education technology, introduced by a cultures dialog into the structure of mathematical education, has been successfully implemented into bachelors and masters training programs at Yelets State Ivan Bunin University (specialization - Pedagogical education; profile - Mathematics). Students have developed the following media educational projects: educational videos on the history of mathematical education ("Magnitsky's Arithmetic", Figure 1) ("Moscow mathematician Bugaev N.V.", Figure 2), an interactive project of an intelligent computer educational system in mathematics based on artificial neural systems ("The Components of Probability Theory and Mathematical Statistics" , Figure 3) , an electronic package of final mathematics tests for a primary school , and interactive scripts for math lessons, etc.

Figure 1. Historical educational video “Magnitsky’s Arithmetic”

Figure 2. Historical educational video “Moscow mathematician Bugaev N.V.”

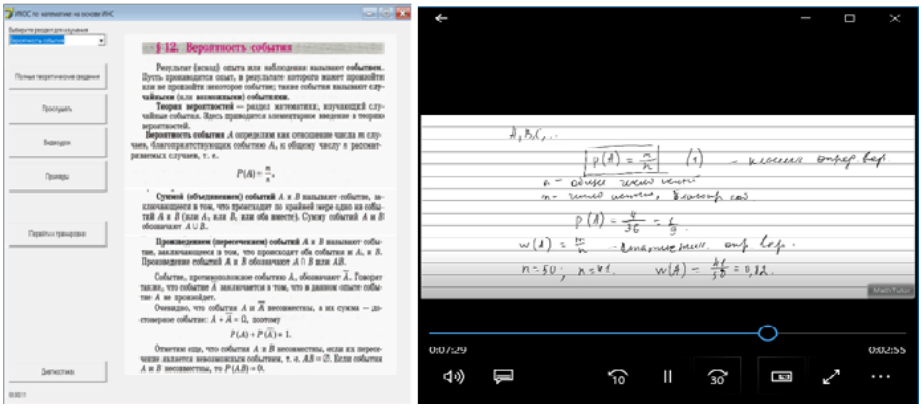

Figure 3. Variants of the training section and videographics of intelligent computer educational system on the topic “Probability of an event”

Assessment of a probabilistic style of thinking

The authors relied on the earlier developed definition of the PST (Dvoryatkina, 2012; Dobrin, 2019) and its justification structure (Dvoryatkina, Shcherbatykh, 2019) for selecting tools used in PST evaluation. In addition, improvements to the list of PST skills were proposed as a result of media education technology implementation in mathematical education, based on a cultures dialogue. This resulted in a significant change in the understanding of critical and heuristic thinking skills. Critical thinking skills were understood as: the ability for critical analysis (to identify and develop a problem and its features, search for resources for its solution, evaluate facts, choose methods for its solution, set goals); the ability to produce an objective probabilistic assessment of the results of mental activity; substantiation of the truth of propositions; and the use of deductive and inductive reasoning to reach the solution.

The Starkey critical thinking test was selected as a diagnostic tool (Starkey, 2004).

The heuristic reasoning skills included: the ability to produce a large number of ideas based on internal cognitive consonance; the ability to overcome emotional instability (dissonance); and the ability to produce unusual, non-standard ideas (originality). The diagnostic procedure was based on the verbal creativity test by Mednik (adapted by Voronin).

Statistical data processing was carried out using the multifunctional Fisher criterion φ*. The criterion made it possible to validate the differences between the proportions of the control and experimental samples in which the analysed effect was observed. The threshold value was exceeded in the level of development of critical component (65 points) and heuristic component (40% on the percentile scale developed for originality index and uniqueness index). The results of statistical analysis are introduced in Table 2.

Table 2. The results of statistical analysis of the experimental data

Groups	**"There is an effect" for the critical component of PST**	**"There is an effect" for the reasonably heuristic component of PST**
	the number of students, scored more than 65 points	the number of students between 0% and 40% percentile
control	10 (33.3%)	11 (36.7%)
experimental	19 (65.5%)	18 (60%)
	φ^*_{cr}=2.36 (p<0.01)	φ^*_{cr}=1.82(p<0.05)

Statistical analysis made it possible to conclude that the implementation of innovative media education technology into the mathematical education, based on a cultures dialogue, contributes to the effective development of critical thinking skills, heuristic skills in particular, and PST as a whole.

Conclusion

This study demonstrated the importance and the possibility of integrating media education technology into the system of mathematical education based on the cultures dialogue. It also examined the importance of integrating these technologies into the process of training for future mathematics teachers, as well as the possibilities associated with such an initiative. After investigating students' educational activities, the study identified positive developments in cognitive and motivational structures, in particular the effective development of PST components (i.e., critical and reasonable heuristic thinking skills). These processes were found to contribute to the successful development of future teachers' mathematical activities. Based on these findings, the following recommendations have been established:

- To develop media education technologies in the context of mathematical education based on the cultures dialogue;
- To integrate media projects into the educational process, taking into account the importance of critically selecting the media products that currently exist in the information space;

- To analyze didactically the feasibility and adequacy of technological innovations in current mathematical knowledge.

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